CLAIMS

1. A mixer design comprising of
   a pair of differential RF inputs connected to
   the source terminals of the first set of two switches, whose drains are connected to
   the source terminals of the second set of two switches, whose drains are the mixer outputs;
   the controlling gates of the first set of switches and the second set of switches are connected to
   the local oscillator differential sources that are phase shifted from each other; wherein each of the first and the second sets of switches comprising of a pair of complementary gate-controlled transistors in a transmission-gate-configuration.
2. The mixer of claim 1 wherein there are three or more sets of switches connected in series.
3. The mixer of claim 1 wherein the switches are based on FET transistors.
4. The mixer of claim 1 wherein the switches are based on GaAs transistors.
5. The mixer of claim 1 wherein the switches are based on MOS transistors.
6. The mixer of claim 1 wherein the switches are single gate-controlled transistors.

7. The mixer of claim 1 wherein the first set of switch gates are connected to the in-phase local oscillator signals and the second set of switch gates are connected to the quadrature local oscillator signals.
8. The mixer of claim 1 wherein the first set of switch gates are connected to the quadrature-phase local oscillator signals and the second set of switch gates are connected to the in-phase local oscillator signals.
9. The mixers of claims 1-8 to be used to reverse the said mixer operations by reversing the inputs and outputs.
10. A method of frequency conversion of an input signal by using two stages of switches to mix the said input signal with reference signals comprising:
providing first and second pairs of differential reference signals which are phase shifted from each other,
mixing a pair of differential input signals with the first pair of reference differential signals through the first stage of switches,
producing a first pair of frequency converted differential signals to mix with the second pair of differential reference signals through the second stage of switches,
producing a final output pair of frequency converted differential signals;

11. The method of claim 10 wherein there are three or more sets of switches connected in series.
12. The method of claim 10 wherein the switches are based on FET transistors.
13. The method of claim 10 wherein the switches are based on GaAs transistors.
14. The method of claim 10 wherein the switches are based on MOS transistors.
15. The method of claim 10 wherein the switches are single gate-controlled transistors.
16. The method of claim 10 wherein the first set of switch gates are connected to the in-phase local oscillator signals and the second set of switch gates are connected to the quadrature local oscillator signals.
17. The method of claim 10 wherein the first set of switch gates are connected to the quadrature-phase local oscillator signals and the second set of switch gates are connected to the in-phase local oscillator signals.
18. The methods of frequency conversion of claims 10-16 to be used to reverse the said mixer operations by reversing the inputs and outputs.